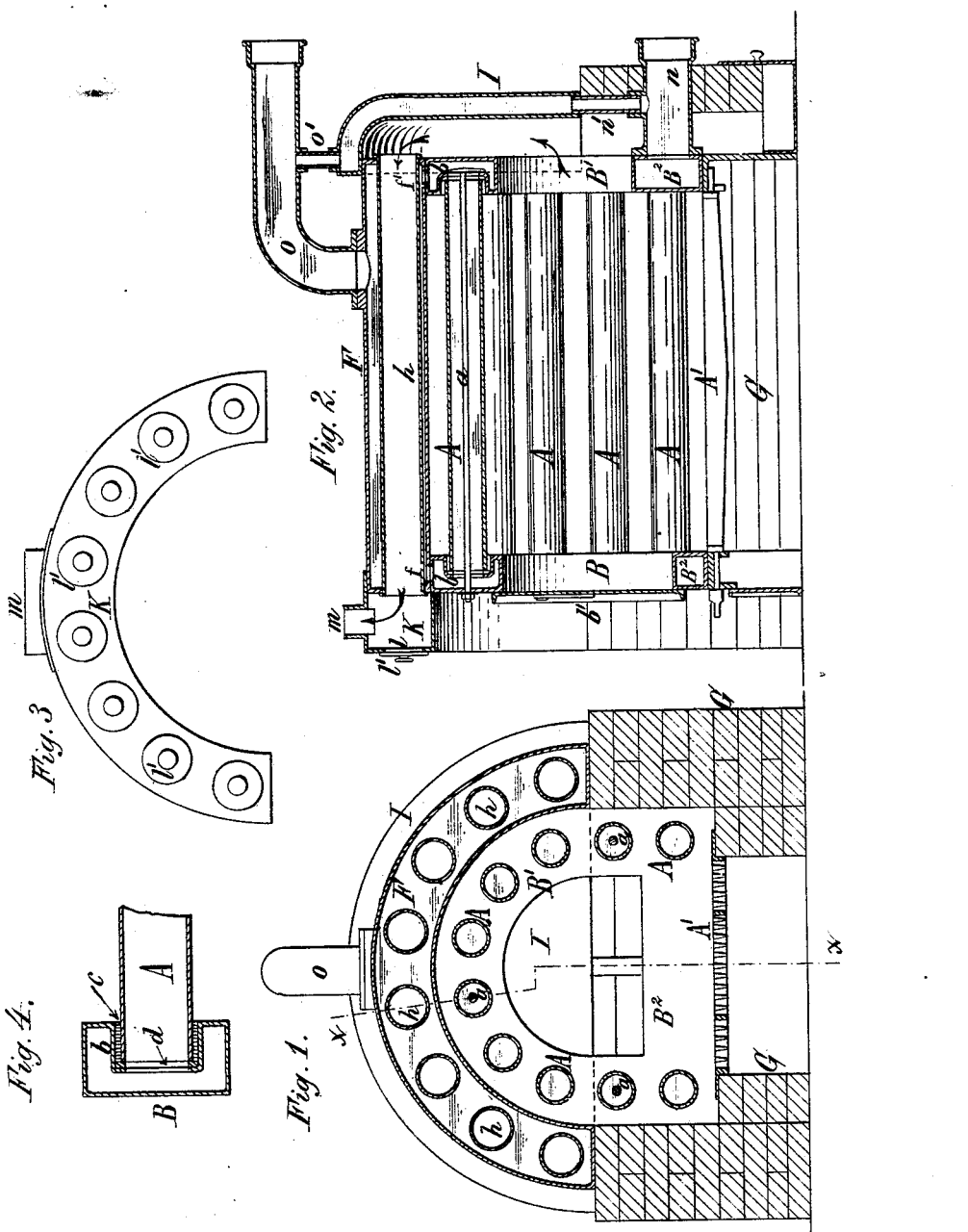
S. & J. BENNETT.

HOT WATER HEATING APPARATUS.

No. 189,687. Patented April 17, 1877.



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STEPHEN BENNETT AND JOHN BENNETT, OF NORTH EVANS, NEW YORK.

IMPROVEMENT IN HOT-WATER HEATING APPARATUS.

Specification forming part of Letters Patent No. **189,687**, dated April 17, 1877; application filed March 23, 1877.

To all whom it may concern:

Be it known that we, STEPHEN BENNETT and JOHN BENNETT, both of North Evans, in the county of Erie and State of New York, have invented certain new and useful Improvements in Hot-Water Heating Apparatus, which improvements are fully set forth in the following specification, reference being had to the accompanying drawing.

Our invention relates to that class of hot-water heating apparatus which are employed for heating green-houses and other buildings, and in which the cold water enters at the bottom, and, after having become heated by contact with the hot surfaces, escapes at the top, so as to maintain a constant circulation of water through the heater.

Our invention has for its object the construction of a heater which shall afford a very large heating-surface within a given space, consume the fuel economically, and at the same time be comparatively simple and cheap in construction.

The nature of our invention will be fully understood from the following description.

In the accompanying drawing, Figure 1 is a cross-section, and Fig. 2 a longitudinal section in line *x x*, Fig. 1, of our improved heater. Fig. 3 is a front view of the smoke-box. Fig. 4 is a detached view on an enlarged scale, illustrating the manner of connecting the water-tubes to the end sections.

Like letters of reference refer to like parts in each of the figures.

A represents a series of water-tubes, arranged in the form of an arch above the fire-grate A′, and connected with their ends to two arch-shaped water-spaces, B B^1, having bottom connections B^2. Each of the spaces B B^1 is cast complete, and provided with a number of sockets, *b*, for the reception of the ends of the water-tubes A. The sockets *b* are recessed into the water-spaces, and made somewhat larger than the tubes A, so that when the ends of the latter are placed in the sockets the space between the socket and the tube can be filled with a suitable cement, as shown at *c*, Fig. 4. If desired, a rubber ring, *d*, may be placed between the end of the tube and the bottom of the socket. The tubes A and water-spaces B B^1 are secured together by several T-headed stay-bolts, *a*, arranged within the tubes A, and tightened by nuts on the front water-space B, which latter, at the same time, forms a frame for the fire-door *b′*. F represents an arch or saddle shaped water-space, arranged so as to inclose or surround the greater portion of the water-tubes A, and form the top of the combustion-chamber. It is set with its sides on brick-work G, which forms the lower side portions of the combustion-chamber. The water-space F is provided with flues *h*, riveted to the end or flue sheets of the water-space, the inner and outer walls of the latter being preferably cast in one piece with the flue-sheets. The end sections B B^1 communicate with the water-space F by openings *f f′*, as shown in Fig. 2, so as to permit of a free passage of the water from the top of the sections B B^1 into the water-space F as the water becomes heated, thereby preventing the formation of steam in the upper portions of the sections B B^1. The water-space F is secured to the sections B B^1 by suitable bolts arranged near openings *f f′*.

I represents a water-back, made of semicircular shape, so as to close the rear end of the fire-chamber, and form a passage or space, through which the products of combustion may travel from the fire-chamber into the return-flues *h*. K is the arch-shaped smoke-box, arranged at the front end of the water-space F, and provided with a series of openings, *l*, corresponding in arrangement with the flues *h*, and closed by removable covers *l′*, so that by removing the latter the flues can be readily cleaned. *m* represents the opening for the smoke-pipe, formed in the upper portion of the smoke-box K. *n* represents the water-influx pipe, connected with the lower portion of the rear water-space B^1, and provided with a branch pipe, *n′*, connecting the main pipe *n* with the lower portion of the water-back I. *o* represents the water escape pipe, starting from the upper portion of the water-space F, and provided with a branch pipe, *o′*, connecting the escape-pipe *o* with the top of the water-back I.

The water-tubes A, water-spaces B B^1, and inner side of the water-space F form a very large direct heating-surface, which transmits the greater portion of the heat generated by

the burning fuel directly to the water contained in the different compartments of the heater.

The hot gases, in escaping from the fire-chamber, strike against the inner side of the water-back I, where they spread until they reach the flues *h*, through which they pass, and finally escape through the smoke-box K and opening *m*. In this manner the hot gases are kept in contact with the water spaces for a great length of time, whereby the heat is absorbed as completely as possible, while loss by radiation to the outside is almost entirely prevented.

The sockets *b*, in which the water-tubes are secured, being recessed into the water-spaces B B^1, are not exposed to the action of the heat, and are thereby prevented from being cracked, which frequently occurs when these sockets or sleeves are arranged on the outside of the water-spaces.

The water enters the heater through the pipes *n n'*, and rises, as it becomes heated by contact with the hot surfaces, until it finally escapes by the pipes *o o'*.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination, with the water-tubes A, arranged in the form of an arch, and water-spaces B B^1, of the surrounding arch-shaped water-space F, provided with return-flues *h*, substantially as and for the purpose hereinbefore set forth.

2. The combination, with the water-tubes A and water-spaces B B^1, of the arch-shaped water-space F, provided with return-flues *h* and water-back I, all arranged as shown, for the purpose set forth.

3. The combination, with the water-tubes A and water-spaces B B^1, of the arch-shaped water-space F, provided with return-flues *h*, and smoke-box K, provided with openings *l* and removable covers *l'*, arranged as shown and described, for the purpose set forth.

4. The combination, with the water-tubes A, of the water-spaces B B^1, having recessed sockets *b*, for the reception of the tubes, substantially as and for the purpose hereinbefore set forth.

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